

BULLETIN NO. 180



OCTOBER, 1925

carded

The Barberry Eradication Campaign in Montana

Its Object, Nature, and Progress

BY

H. E. MORRIS

*Associate Botanist,
Montana Experiment Station*

AND

W. L. POPHAM

*Agent, Office of Cereal Investigations,
Bureau of Plant Industry
United States Department of Agriculture*

UNIVERSITY OF MONTANA
AGRICULTURAL EXPERIMENT STATION
BOZEMAN, MONTANA



CONTENTS

	Page
Introduction	3
Losses caused by stem rust.....	4
Life history of black stem rust.....	4
The relation between barberry and black stem rust.....	6
Evidence against the common barberry.....	8
History of the common barberry	10
Varieties of barberry in Montana.....	11
Summary of campaign in the thirteen States.....	12
The barberry eradication campaign in Montana.....	14
Stem rust spreads from barberries in Montana.....	18
Methods of eradication used in Montana.....	20
Proclamation of barberry quarantine	22
Montana barberry eradication law	23

The Barberry Eradication Campaign in Montana

In 1916 when the market price of wheat was high and the demand constant, due wholly or in part to the unsettled conditions in Europe, a great epidemic of black stem rust swept over the wheat belt of the United States. As a result the nation suffered an estimated loss of 200,000,000 bushels of wheat and correspondingly large losses of other cereals. The enormous loss in this important commodity at such a critical time commanded the attention of both the economists and the pathologists of the country and resulted in the organization of the Barberry Eradication Campaign. The purpose of this campaign is to reduce and control black stem rust by eradicating the barberry bush that harbors and spreads it.

The campaign was begun by the United States Department of Agriculture, in cooperation with the State agricultural colleges of Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming, in an effort to eradicate all common barberry bushes growing within the boundaries of these States. Later the Conference for the Prevention of Grain Rust, composed of representatives of agricultural and allied interests, and many other smaller organizations cooperated to make the campaign more effective. As the common barberry is necessary to complete the life cycle of the rust parasite in this territory, the campaign now under way, when completed, will greatly reduce, if not entirely prevent, losses from this source.

LOSSES CAUSED BY STEM RUST

Black stem rust of small grains is perhaps the most widespread and destructive plant disease known. Wherever wheat, oats, barley, or rye is grown extensively, this parasite may be found causing some loss. During the past twelve years it is estimated to have caused an average annual loss of 50,000,000 bushels of small grain in the United States. The greater part of this loss has occurred in the thirteen States now included in the barberry eradication area. It is estimated that in 1916 black stem rust took 180,000,000 bushels as its toll from the States producing spring wheat, and Montana, Minnesota, North Dakota, and South Dakota suffered the greater part of this loss.

LIFE HISTORY OF BLACK STEM RUST

Black stem rust is caused by a minute parasitic fungus scientifically known as *Puccinia graminis* which grows on small grains and some of the closely related grasses. It has a complicated life history, one stage of which occurs on the common barberry.

This stage on the barberry, known as the aecial or cluster-cup stage, appears as little yellow spots or clusters on the under side of the leaves, soon after they unfold in the spring. Each spot or cluster is composed of a number of cups, each of which contains thousands of tiny yellow spores. These spores can not produce rust on other barberry leaves but can grow only on small grains and grasses where, under favorable conditions, each spore germinates and produces the red stage of stem rust.

This red or uredinial stage of the rust usually appears on the sheaths and stems of small grains or grasses. In very severe rust attacks the heads of grain also will be rusted. The spots or pustules of stem rust on grains are oblong in shape. They can be distinguished readily from other rusts as they break through the epidermis of the plant and the other rusts do not. The spores of this red stage of stem rust will spread to other grains or grasses but can not produce rust on the barberry bush. Under favorable weather conditions each of these pustules produces thousands of new spores which in turn con-

tinue to infect small grains and grasses. This makes it possible for entire districts to become infected from a common source in a comparatively short time.



Fig. 1.—The common barberry. It spreads black stem rust.
(Courtesy U. S. Dept. of Agriculture.)

The black or telial stage appears on the grains and grasses when they begin to mature. The same pustules which produced the red spores also produce the black or telial spores of the rust. This stage is present on the grain at harvest time and is the one most commonly recognized as black stem rust. These spores are thick-walled and dark brown to black in color. They

can not reinfect the grains and grasses. They remain over winter on the old straw and stubble, and when the weather becomes warm in the spring these spores germinate and produce small, almost colorless spores, called sporidia, which are capable of germinating and growing only on the barberry leaves, producing the cluster-cup stage, and the life cycle of the rust is complete. If barberries are not present, the small spores produced by the black stage die, as they can not produce the cluster-cup stage on other plants.

We thus have four distinct stages in the life history of this parasite: (1) the cluster-cup stage on the under side of the barberry leaf in the spring and early summer; (2) the red stage on grasses and grains during the growing season; (3) the black stage on grains and grasses during the fall, winter, and early spring; (4) the white, or sporidial stage, which starts the rust on barberry in the spring.

THE RELATION BETWEEN BARBERRY AND BLACK STEM RUST

The part played by the barberry in spreading black stem rust of small grains depends to a large extent upon the geographical location. In the mild climate of the southern and southwestern States the red stage of stem rust will live continuously from one year to the next on grains or grasses. Farther north, in the spring-wheat region, the red stage of the rust has not been found to live through the winter. Infected barberry bushes existing within this area appear to be entirely responsible for the source of the stem rust in the spring.

The red spores may be carried for long distances by the wind and still retain their viability, so there is a possibility that wind-blown spores from sources outside the eradication area might start an epidemic in the northern spring-wheat districts. However, it has not been possible to trace such spreads of stem rust from the southern to the northern grain-growing areas. Under extremely favorable weather conditions this source of inoculation might be responsible for light infections in the north. Infection from barberries has always appeared before such in-blown inoculum has arrived, and it seems certain that stem-rust infection from the South has little, if any, ef-

fect on the rust situation in Montana. It is probable that some stem-rust inoculum is blown into Montana from other States in the eradication area. The rust started from barberries in these States undoubtedly will be controlled through their eradication by the time the Montana barberries are entirely destroyed. The direction of the wind and its velocity are important factors in the distribution and severity of the disease in infected localities.

There are several specialized physiologic varieties or forms of *Puccinia graminis* each being confined to a certain group of hosts. One of these, *Puccinia graminis tritici*, which attacks wheat, barley, and some native grasses, has several subforms which vary in their ability to infect different varieties of wheat. This being the case, it is improbable that those strains most commonly encountered in the South would attack small grains when transferred to the upper Mississippi Valley and to the varieties of grain grown in Montana. This would also hold true of spores from the Pacific coast. There seems to be very little regional interchange of spores because of the difference in climatic conditions and in the varieties of grain grown.

In the spring-wheat States now included in the barberry eradication area, where the presence of the common barberry is the determining factor in the spread of black stem rust, we have other secondary factors to consider. The black-spore stage of the rust, which survives the winter in the northern States, is the source of infection for the local barberries in the spring. These spores germinate on the old straw and stubble, producing sporidia under quite a wide variety of conditions. In some years they may germinate when conditions are not favorable for the barberry to become infected. For example, the black spores can germinate when the existing condition is one of relatively high humidity and low temperature. Under this condition the black or telial spores may germinate before the leaf buds of the barberry begin to unfold. Again, weather conditions may be very favorable for small-grain growth but unfavorable for stem-rust germination. This lack of rust in some years causes many people to believe that weather conditions cause outbreaks of stem rust and that the barberry plays no part in its spread.

There are several varieties of leaf rust, each confined to a single grain crop, which often are confused with stem rust. None of these leaf rusts attacks the barberry, and they cause very little damage in Montana even when infection is quite heavy. The leaf rust differs from black stem rust in many respects. As the name implies, it occurs only on the leaves and sheaths of the grain, producing small circular pustules. The red stage of this rust, which occurs about the same time as the red stage of black stem rust, appears as small round pustules filled with orange-colored spores, instead of the deep red spores borne in oblong pustules that are typical of the red stage of black stem rust. The black or winter stage of the leaf rust differs from stem rust in that the pustules are grayish-black in color and the epidermis of the plant does not break and curl back from the pustule as it does in black stem rust.

EVIDENCE AGAINST THE COMMON BARBERRY

In 1865 it was proved conclusively that the common barberry is an important factor in the dissemination of black stem rust of small grains and closely related grasses. For many years previous, even as early as 1660, farmers in Europe were aware that the barberry, when growing near fields of small grains, had a very definite relation to the appearance of stem rust. In many cases laws were passed prohibiting the planting or growing of the bush, although at that time it was not known in just what manner it was responsible for the damage caused to the crops. Before the American Revolution, Massachusetts, Connecticut, and Rhode Island passed laws requiring that all barberry bushes be destroyed, but these laws were not rigidly enforced.

More than twenty years ago Denmark started an active campaign to destroy all common barberry bushes within its boundaries. That country has had no extensive stem-rust epidemics since the work was completed. Throughout Europe the eradication of the common barberry has come to be recognized as the most economical means of controlling black stem rust. Pathologists of Denmark, England, Germany, and many other European countries are convinced that serious losses of small grain from black stem rust can be prevented by removing the

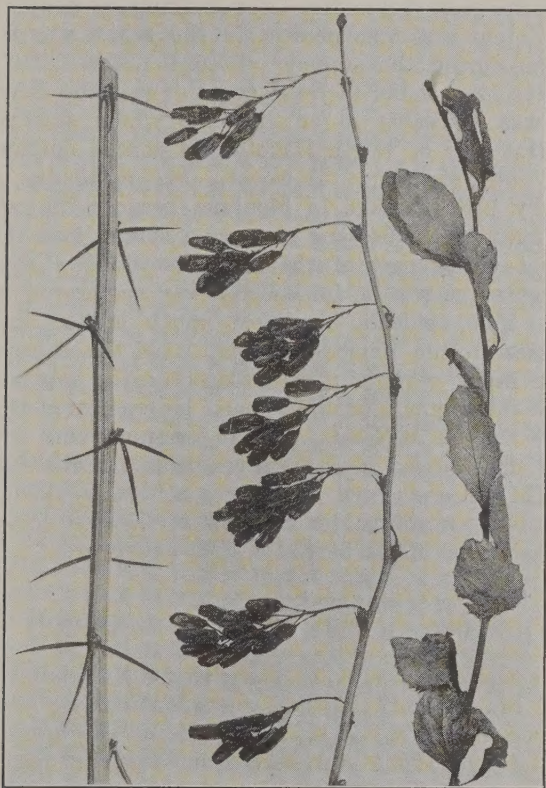


Fig. 2.—The characteristics of the common barberry. Note the three to five thorns beneath each cluster of leaves; the berries produced in clusters similar to those of the currant; the leaves greenish or purplish with saw-toothed edges.

common barberries from grain-growing districts. Practically every important grain-growing country of Europe has legislated against the common barberry.

The fact that the barberry is of such importance in starting black stem rust in the spring-wheat States of this country does not necessarily mean that eradicating all of the barberries from one farm, one county, or even one entire district will free

it from stem rust thereafter. For example, a heavy, late infection of stem rust was present in the northeastern counties of Montana during the summer of 1924. Since 1919 no barberries have been found in these counties and the infection apparently was traceable to an epidemic which started in the north-central part of North Dakota and spread northward and westward into Montana. However, this particular outbreak caused very little damage in Montana because the grain was reaching maturity before the stem rust spread into this State. In the east-central part of the State, however, a similar epidemic occurred where the initial infection was traced to a local barberry. This epidemic developed much earlier and caused heavy losses in the immediate vicinity of the infected bush. These and many other similar instances offer substantial evidence that the common barberry must be eradicated from cities and towns as well as from farms in grain-growing areas. As stem rust may spread long distances from infected barberries, they should be eradicated whether near grain fields or not. The successful control of stem rust in any section depends upon the eradication of all barberries in the entire area.

HISTORY OF THE COMMON BARBERRY

The common barberry is a native of Asia but about the middle of the fifteenth century it was introduced into Europe for the medicinal value of its roots and for the berries it produced. It then became scattered throughout Europe, in many localities escaping from cultivation and growing wild like the native shrubs. The barberry was introduced into the United States by the colonists, and because of its adaptability to the northern half of this country and its ornamental value as a shrub it has been planted extensively throughout the upper Mississippi Valley and the western States.

The oldest barberry bushes in Montana undoubtedly were brought in by the early settlers. Later many bushes were sold in the State by nurseries until 1918 when the sale of the common barberry was prohibited.

VARIETIES OF BARBERRY IN MONTANA

The common barberry (*Berberis vulgaris* L.) shown in Figure 1, is an erect, spiny shrub, which grows to a height of five to six feet in Montana. The stalks are woody with dull gray bark. The inner bark of both stems and roots is bright yellow. The leaves are borne in clusters on the stalk. Growing out and slightly down from each cluster is a group of three to five thorns. The leaves have spiny, saw-toothed edges, are rounded at the tip, and may be either green or purplish in color. The small, yellowish flowers and bright red, oblong berries hang in clusters similar to those of currants. The berries shrivel in the fall but may be found hanging on the bush until late in the winter (Figure 2).

The Japanese barberry (*Berberis thunbergii* D. C.) does not harbor or spread stem rust. Its planting in place of the



Fig. 3.—The Japanese barberry. It does not spread black stem rust.
(Courtesy U. S. Dept. of Agriculture.)

common harmful barberry is being encouraged. The Japanese barberry is low and spreading, growing about two to four feet high in Montana. Figure 3 shows its habit of growth and general appearance. The stalks of this species are slender and the bark is reddish-brown. The leaves are deep green in color, have smooth edges, and are rounded at the tip. The flowers are bright yellow and the scarlet berries are borne singly or in two's like gooseberries. They hang on the bush into the late winter and remain solid and plump (Figure 4). The Japanese barberry, which is much more attractive than the common barberry as an ornamental or hedge plant, is becoming very popular for lawn decoration.

Mahonia aquifolium and *Mahonia repens*, both commonly called Oregon grape, are closely related to the common barberry and are native to Montana. *Mahonia aquifolium* has been found only on the western slope of the Rocky Mountains, but *Mahonia repens*, is generally distributed throughout the mountainous region of this State. Neither of these, however, has ever been found infected with black stem rust in its natural habitat. *Mahonia aquifolium* has been infected artificially.

SUMMARY OF CAMPAIGN IN THE THIRTEEN STATES.

The campaign which was started in 1918 to eradicate all common barberry bushes in the thirteen previously named States was undertaken as the most economical means of reducing the extensive annual losses caused by black stem rust. The magnitude of the undertaking necessitated a certain amount of preliminary work. Extensive epidemiology studies were carried on throughout the Mississippi Valley to determine all possible sources of stem rust inoculum for the spring-wheat States. A preliminary survey was started in each of the thirteen States to gain some knowledge of the distribution and number of barberries. The results of this work were conclusive. The popularity of the barberry with early settlers had caused it to be planted in practically every permanently settled community. The rust studies proved without question that the common barberry bushes growing within the eradication area were largely responsible for all widespread stem-rust epidemics in the northern spring-wheat States.

In the year following the preliminary survey a number of the States included in the eradication area began a farm-to-farm survey. Most of the States have now completed their first survey and it is well advanced in the others. A summary of results from the entire area shows that approximately 6,500,000 planted and escaped barberry bushes have been located and that about 6,000,000 of these have been destroyed. In addition, thousands of seedlings and sprouting bushes have been destroyed, making a grand total of over 12,000,000 bushes, sprouting bushes, and seedlings found, of which 11,500,000 have been destroyed. The work of destroying the remaining bushes is progressing as rapidly as conditions will allow.

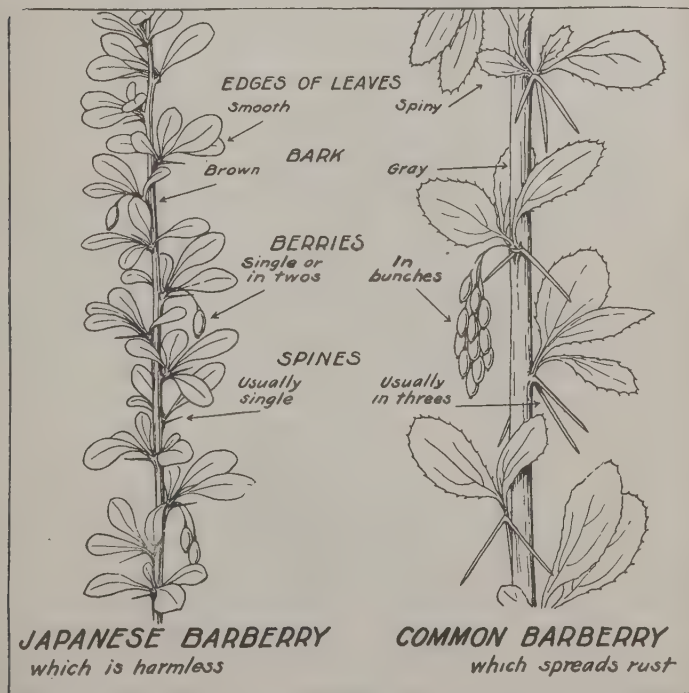


Fig. 4.—The Japanese barberry compared with the common barberry.
(Courtesy U. S. Dept. of Agriculture.)

At the beginning of the campaign barberry bushes were so numerous in many of the States that only by the most careful observation was it possible to trace the source of widespread epidemics. As the bushes were so plentiful and there was always plenty of inoculum, the condition of the weather was usually the factor limiting the spread of rust. However, since great numbers of these barberries have been removed, local outbreaks of stem rust are used by the field men in tracing the location of the remaining bushes. During the summers of 1924 and 1925 a great many local epidemics of stem rust were reported by field men from various parts of the eradication area. In practically every case these local epidemics were traced to the barberry bushes that caused them. It is believed that some of the States would have suffered much heavier losses from rust during these two years had not so many of the bushes already been removed.

THE BARBERRY ERADICATION CAMPAIGN IN MONTANA

A preliminary survey of the principal cities and main irrigated areas of Montana was begun in 1918 and continued in 1919 and 1920. A systematic farm-to-farm survey was begun in the summer of 1923, covering Fergus, Judith Basin, and parts of Fallon, Flathead, and Lake counties during that season. In 1924 the Federal allotment for Montana was increased and a systematic survey of the counties along the eastern border of the State was completed. The same allotment was provided in 1925 and this made possible the completion of the survey in a number of counties along the southern border and in the central part of the State. A summary of the work at the close of 1925 shows that, including those found during the preliminary survey, 296 properties having 11,293 bushes have been located. Of this number, 11,100 bushes growing on 292 properties have been removed or otherwise destroyed. Of these bushes, 1861 had escaped from cultivation and were distributed over 19 different properties in 6 counties. In addition, 4771 seedlings were found and destroyed in Carbon, Fergus, Flathead, Gallatin, Lake, and Yellowstone counties. Some of these were found two miles from the original planting and without question had grown from seeds scattered by birds.

Nearly thirty years ago a hedge of common barberry bushes was planted on a property in Lake County on the west shore of Flathead Lake. Many seeds had been scattered from this hedge by birds and other agencies until the largest area of escaped barberries yet located in Montana was produced. Some of the larger bushes were found in the edge of virgin timber land more than two miles from the original planting. These escaped bushes ranged from two inches to eight feet in height. The original hedge was removed in 1919 and the seedlings and escaped bushes in 1923 and 1924 but, owing to the mountainous timber land, lake shore, and rough pasture land, further careful survey will be necessary to insure complete eradication.

In the progress of the campaign eight areas of escaped bushes have been located in Montana. However, it is believed that the location discussed above is the only area of escapes reported to date that will present a serious problem in eradication. During the summer of 1924 three planted bushes and 31 seedlings were removed from one property in Flathead County. About the same time field men destroyed 44 escaped bushes in Carbon County. In July, 1925, two escaped areas having over 800 escaped bushes and 1200 seedlings were located in Yellowstone County. From a property in Carbon County 33 bushes and 185 seedlings were removed, and during the later part of the summer about 1000 seedlings were destroyed on a property in Madison County. In addition to the foregoing, escaped areas were located, during the early part of the campaign, in Fergus and Lake counties.

The preliminary survey conducted in Montana during the early years of the campaign disclosed the fact that barberry bushes were distributed throughout the entire State, although they were more prevalent in the older and more thickly settled communities. Figure 5 shows the territory covered by the preliminary survey, the counties in which the original survey has been completed, and the location of areas of escaped barberry bushes to December 31, 1925. The greatest numbers of barberries were found in Flathead, Yellowstone, and Lake counties. Flathead and Yellowstone are perhaps the two most thickly populated counties in the State and their residents have planted a great deal of shrubbery on the farms as well as in the towns.

BARBERRY ERADICATION CAMPAIGN

17

TABLE I.—DATA SHOWING, BY COUNTIES, THE NUMBER OF BARBERRY BUSHES, ESCAPED BARBERRY BUSHES, AND SEEDLINGS FOUND IN MONTANA TO DECEMBER 31, 1925.

County	Total number of barberry bushes found	Total number of escaped bar- berries found	Total number of seedlings found
Beaverhead	18	0	0
Big Horn	0	0	0
Blaine	0	0	0
Broadwater	11	0	0
Carbon	194	44	192
Carter	0	0	0
Cascade	144	0	0
Chouteau	80	0	0
Custer	147	0	0
Daniels	0	0	0
Dawson	442	0	0
Deer Lodge	0	0	0
Fallon	0	0	0
Fergus	231	6	0
Flathead	4,162	344	952
Gallatin	385	1	169
Garfield	0	0	0
Glacier	0	0	0
Golden Valley	0	0	0
Granite	0	0	0
Hill	3	0	0
Jefferson	0	0	0
Judith Basin	0	0	0
Lake	669	664	720
Lewis and Clark	290	0	0
Liberty	0	0	0
Lincoln	0	0	0
McCone	0	0	0
Madison	64	0	1,500
Meagher	0	0	0
Mineral	3	0	0
Missoula	182	0	0
Musselshell	50	0	0
Park	388	0	0
Phillips	0	0	0
Pondera	0	0	0
Prairie	0	0	0
Powder River	0	0	0
Powell	115	0	0
Ravalli	620	0	0
Richland	13	0	0
Roosevelt	0	0	0
Rosebud	19	0	0
Sanders	168	0	0
Silver Bow	0	0	0
Sheridan	0	0	0
Stillwater	5	4	0
Sweet Grass	10	0	0
Teton	0	0	0
Toole	0	0	0
Treasure	0	0	0
Valley	6	0	0
Wheatland	0	0	0
Wibaux	127	0	0
Yellowstone	2,747	798	1,238
Total.....	11,293	1,861	4,771

Only two locations of planted barberries were reported from Lake County. However, a large area of escaped bushes makes this county rank third in total number of bushes found and destroyed. In studying the map (Figure 5) in connection with Table I, the reader must consider that some of the counties where hundreds of bushes have been located have had only a preliminary survey. On the other hand, some counties where very few bushes have been found have been completely surveyed.

STEM RUST SPREADS FROM BARBERRIES IN MONTANA

Examples where local stem-rust epidemics were directly traceable to common barberry bushes have been reported from Flathead, Carbon, Yellowstone, Rosebud, and Richland counties. In 1923 sprouting barberry bushes growing on the public school lawn in Forsyth, Rosebud County, were found heavily infected with stem rust. Western wheat grass and wild barley near the bushes were heavily rusted. Although the season was very dry the spread of rust from these bushes was apparent. The nearest grain field was over two miles distant so it was not possible to trace infection to any grain.

A very striking example of the spread of stem rust from a single barberry was found in eastern Montana during the summer of 1924. A single purple barberry, heavily infected with stem rust, was found growing on a lawn about two miles southwest of Sidney, Richland County. The native grasses immediately surrounding the bush were heavily infected with rust. The worst damage was caused in a field of Dale Club wheat belonging to a neighbor, who stated that it had been impossible to raise a satisfactory crop of wheat on that particular piece of ground since 1916, owing to damage caused by stem rust. The damage caused in this field in 1924 varied from 80 per cent of the crop growing near the barberry to about 4 per cent on the outskirts of the infected area. Figure 6 shows in detail the spread of rust from this particular barberry.

In 1925 many of the barberry bushes located in Yellowstone County were rusted. In practically every case infection had spread to native grasses in the immediate vicinity; and in

one case where heavily infected bushes were growing in a deserted farmyard, stem rust could be traced to a field of Marquis wheat about one-half mile away.

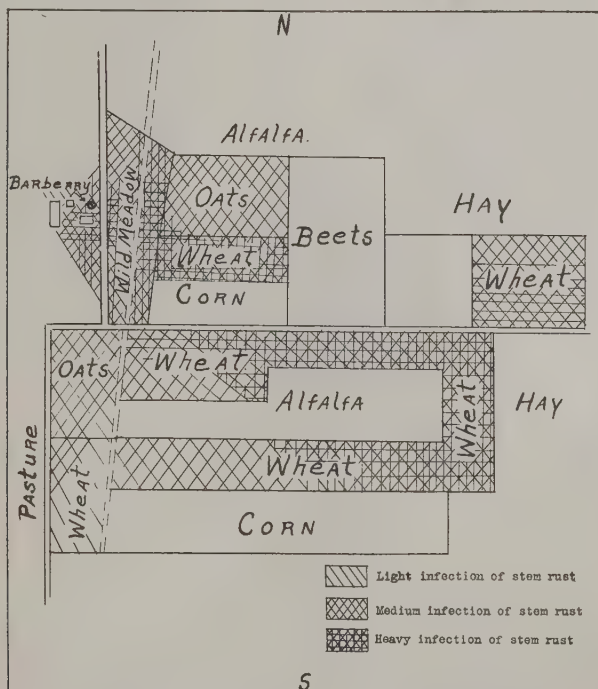


Fig. 6.—Map showing the spread of stem rust from a single barberry in Richland County in 1924.

Losses from stem rust in Montana vary from year to year. In 1916 this State suffered damages amounting to over 3,000,000 bushels of wheat. Losses were quite heavy in 1917 and 1919, and in 1923 the reduction in yield due to rust was almost as great as in 1916. During the ten-year period from 1915 to 1924, inclusive, Montana lost about 14,800,000 bushels of wheat. The average annual loss from stem rust on all small grains in the State of Montana during the same period is estimated at 1,503,900 bushels.



Fig. 7.—Stem rust as it appears on the barberry leaves in the spring and on the stems of the grain in the fall.

METHODS OF ERADICATION USED IN MONTANA

The common barberry is a very hard bush to kill. During the early part of the campaign digging was the most common method of eradication, but nearly all of the bushes removed by digging were found to be sprouting when the locations were visited a year or two later. It was found that a piece of root the size of a pencil would send up sprouts if left near the surface of the ground. To overcome this difficulty experiments with chemicals were made to determine a more efficient method of destroying the bushes. Of the many different chemicals tried, crushed rock salt and kerosene were found to be the most satisfactory. They were the only chemicals that were effective, easily available, and at the same time reasonably cheap.

Chemical eradication has replaced the digging method, wherever possible. Ten pounds of salt poured into the crown of a bush which measures 12 inches in diameter at the base of the shoots will kill the bush. If the kerosene treatment is pre-

ferred, about one gallon should be applied to a bush of this size. The amount of salt or kerosene necessary to kill a bush varies in proportion to the size of the bush, though not less than two pounds of salt or a pint of kerosene should be used on the smallest bush. Either of these chemicals will kill the barberry in a comparatively short time and will eliminate the danger from future sprouting. Chemicals of any kind should not be used when other shrubbery is growing within three or four feet of the barberry, as it too may be killed. Such bushes should be dug and care taken that every root is removed.

Although very little danger to live stock accompanies the use of salt, there is some danger of killing hogs or poultry if they are allowed access to salted bushes. To prevent any possible harm to live stock or poultry the salted bushes should be fenced in or the salt covered with dirt, stones, or boards.

COOPERATION

The following Proclamation and the Barberry Eradication Law were passed in 1918 and 1919. However, the fine cooperation of property owners and nurserymen has made it unnecessary to resort to legal action in this State. Montana's citizens realize that the small-grain crop annually equals many thousands of times the value of the barberries in the State.

Although agents of the United States Department of Agriculture or of the State will survey every community for barberry bushes, the effectiveness of the campaign depends upon the cooperation of the residents of each community in aiding the men to find the last barberry bush. Every property owner should become acquainted with this harmful barberry bush and aid in its destruction. Property owners who think they have barberry bushes should send a twig from the bushes to the Barberry Eradication Office, State College, Bozeman, Montana, for identification before destroying them.

PROCLAMATION BY THE GOVERNOR

Quarantine No. 3, April 28, 1918.

WHEREAS, The fact has been determined that a dangerously injurious plant disease known as Wheat Rust is disseminated and carried by means of Barberry bushes (*Berberis vulgaris*), both of the green and purple form: and

WHEREAS, There is danger of the introduction of this disease into the great wheat fields of Montana through shipments of said Barberry bushes and a further dissemination of said wheat rust through the agency of Barberry bushes:

NOW, THEREFORE, I, S. V. Stewart, Governor of the State of Montana, under and by virtue of the authority conferred upon me by Chapter 61 of the Session Laws of the Thirteenth Legislative Assembly, do hereby declare and proclaim that a quarantine be and hereby is established against the importation into the State of Montana of Barberry bushes, (*Berberis vulgaris*) and plants from any point without the said State of Montana.

All quarantine guardians and deputy state horticultural inspectors are hereby instructed and required to refuse admission into Montana of any shipments of Barberry bushes, (*Berberis vulgaris*) or plants. It shall be the duty of the deputy horticultural inspectors, or other quarantine guardians, to deport immediately such shipments or destroy them by burning. All expenses incurred in deporting or destroying such shipments shall be paid by the consignor.

Any person who sells or offers for sale, in the State of Montana, Barberry bushes (*Berberis vulgaris*) or plants contrary to this quarantine order shall be liable to prosecution under the laws of the State of Montana.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State to be affixed.

DONE at the City of Helena, the Capital, this the twenty-fourth day of April in the year of our Lord one thousand nine hundred eighteen.

(Signed) S. V. STEWART.

By the Governor:

C. T. Stewart, Secretary of State.

MONTANA BARBERRY ERADICATION LAW OF 1919

(House Bill No. 243)

A Bill for an Act Entitled: "An Act Providing for the Eradication of Harmful Barberry and Extending the Provisions of the Act to Mahonia in Case of Necessity; and Defining the Powers and Duties of the State Board of Horticulture."

Be it Enacted by the Legislative Assembly of the State of Montana:

Section 1. That it shall be unlawful for any person, firm or corporation to sell, offer for sale, barter, give away, exchange, deliver, ship, transport, receive or accept for shipment or transportation, plant or permit to exist on his or its premises in the State of Montana any plant of the harmful barberry.

Sec. 2. It shall be the duty of the State Board of Horticulture or its duly authorized inspectors to enforce the provisions of this Act and they are hereby empowered to cause to be eradicated any such harmful barberry plants found growing anywhere in the State. If the owner of the land on which such harmful plants are found growing shall fail or refuse to eradicate such plants within ten (10) days after receiving a written notice to that effect from a horticultural inspector, said inspector shall proceed to have such harmful barberry plants eradicated and destroyed wherever they may be found growing. As soon as the horticultural inspector has had such harmful barberry plants eradicated and destroyed he shall make out a statement in duplicate of the actual cost and expense incurred by him in eradicating or destroying such harmful barberry plants. One of such statements shall be transmitted to the land owner affected by the work and the other shall be filed in the office of the treasurer of the county wherein such land is situated. The treasurer shall place such amount so indicated in such statement on the tax duplicate against the land of the land owner affected by such work and such amount so entered shall be collected in the same manner and at the same time as taxes are collected, and when so collected shall be paid by the Treasurer to the State Board of Horticulture, which shall remit to the State Treasurer to be added to the appropriation for the use of the State Board of Horticulture.

Sec. 3. The term "harmful barberry" as used in this Act shall be construed to apply to any species of *Berberis* and as hereinafter provided for, to *Mahonia*, which are susceptible to infection by *Puccinia graminis*, commonly called black stem rust of grain (but not including Japanese barberry, *B. thunbergii* which does not propagate the rust).

Sec. 4. The State Board of Horticulture is hereby empowered to apply the provisions of this Act to species of *Mahonia* whenever in its judgment the necessity arises.

Sec. 5. Any person, firm or corporation which shall violate any of the provisions of this Act shall be deemed guilty of a misdemeanor and upon conviction thereof shall be fined any sum not less than ten dollars (\$10.00) and not more than twenty-five dollars (\$25.00) for each offense.

Sec. 6. All acts and parts of acts in conflict herewith are hereby repealed.

Sec. 7. This act shall be in full force and effect from and after its passage and approval.

Approved: February 21, 1919.